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MILLER IP GROUP, PLC
GENERAL MOTORS CORPORATION
42690 WOODWARD AVENUE
SUITE 200
BLOOMFIELD HILLS, MI 48304

EXAMINER	
WALKER, KEITH D	

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Please find below and/or attached an Office communication concerning this application or proceeding.

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/763,633
Filing Date: January 22, 2004
Appellant(s): YAN ET AL.

John A. Miller
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed December 10, 2007 appealing from the Office action mailed July 16, 2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

NEW GROUND(S) OF REJECTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 8 & 21-29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Regarding claims 8 and 21, the limitation in question claims a "catalyst ink includes a catalyst, solvent and an ionomer having a concentration that is about half of the ionomer concentration of the catalyst as a ratio of ionomer to carbon in a final cathode or anode of the MEA." The instant disclosure does not support a concentration of the ionomer being "about half of the ionomer concentration of the catalyst", regardless of the ratio of ionomer to carbon. Based on antecedent basis, "the catalyst" refers back to the catalyst that makes up the ink and the instant specification does not support an ionomer concentration that is compared with this catalyst.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 8 & 21-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Regarding claims 8 and 21, the limitation "an ionomer having a concentration that is about half of the ionomer concentration of the catalyst as a ratio of ionomer to carbon in a final cathode or anode of the MEA" is indefinite because the limitation does not distinctly claim the subject matter which

applicant regards as the invention. The concentration of ionomer is based as being half of the ionomer concentration of the catalyst and compares this value to a ratio of ionomer to carbon. First, it is unclear what concentration of ionomer a catalyst has since a catalyst is in this case an element, like platinum. Second, it is unclear what the relationship between the ionomer and the catalyst has with a ratio of ionomer to carbon?

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

2002/0034675	STARZ et al	3-2002
6,277,513	SWATHIRAJAN et al.	8-2001
5,330,860	GROT et al.	7-1994

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 5-8, 10, 11, 13, 14 & 21-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Publication 2002/0034675 (Starz).

Starz discloses a method of making a membrane electrode assembly (MEA) consisting of spraying catalyst ink on both opposite surfaces of a proton conducting membrane in the protonated form. The catalyst ink comprises a catalyst, a solvent and half the concentration of ionomer in the final catalyst ([0031, 0032, and 0054]). The MEA is then soaked in sulfuric acid and then in water.

Starz is silent to clamping the membrane.

It would be obvious to one of ordinary skill in the art to use a clamp to hold the membrane in the process of making an MEA. Furthermore, applicant admits on page 8 of the arguments that "One of ordinary skill in the art would readily recognize what type of clamp would be needed for this purpose..."

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify Starz's method of making a membrane with a clamp well known in the art for the purposes of securing the membrane and preventing the membrane from wrinkling, which are also well known by one of ordinary skill in the art.

Starz is silent to first spraying on the ionomer and then spraying on the catalyst ink. Starz teaches mixing the ionomer and the catalyst together and spraying the combination in one step as opposed to two separate steps. It would have been obvious to one skilled in the art to separate the single spraying step of one combination component into two separate spraying steps comprising the two components of the

combination, since it is held that separating known integral components into various elements involves only routine skill in the art (MPEP 2144.04).

Starz is silent to using a heat lamp for drying the membrane. Starz teaches using a circulating air oven for drying the membrane. Since no criticality has been given to the use of the heat lamp for the drying of the membrane and in the absence of unexpected results, the use of the oven to dry the membrane is seen as an equivalent drying process as the claimed heat lamp.

Starz is silent to spraying multiple layers to acquire a desired thickness. It would have been obvious to one skilled in the art to spray multiple layers of any substance, such as a catalyst layer, to achieve a desired thickness of the sprayed layer.

Claims 2, 6, 12-14, 22-24 & 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Publication 2002/0034675 (Starz) in view of US Patent 6,277,513 (Swathirajan).

The teachings of Starz as discussed above are incorporated herein.

Starz is silent to first spraying on the ionomer and then spraying on the catalyst ink, spraying multiple layers, using a heat lamp and hot pressing the MEA.

Swathirajan teaches making an MEA with layered electrodes consisting of a first layer having an ionomer layer without a catalyst and then a second layer comprising the catalyst is applied on top of the first layer (Abstract, 7:1-15). A heat lamp is used to dry the catalyst layer (9:5-15). It would be obvious to one skilled in the art at the time of the invention to combine the spraying and drying step to quicken the process of making a

membrane. After the membrane is coated on both sides, the assembly is hot pressed forming the final MEA with both electrodes (7:35-50). This process of making a layered electrode improves catalyst utilization in the fuel cell and improves reactant gas diffusion (1:40-46, 2:40-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the fuel cell of Starz with the layered electrode of Swathirajan to increase the catalyst utilization, which reduces the amount needed and therefore reduces the manufacturing cost of the electrodes.

Claims 5, 12, 13, 23 & 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Publication 2002/0034675 (Starz) in view of US Patent 5,330,860 (Grot).

The teachings of Starz as discussed above are incorporated herein.

Starz is silent to using a heat lamp and hot pressing the MEA.

Grot teaches using a heat lamp and pressure to fix the catalyst ink onto the membrane (8:15-50). It would be obvious to one skilled in the art at the time of the invention to combine the spraying and drying step to quicken the process of making a membrane. The heat and pressure securely bind the catalyst ink to the membrane to prevent delaminating of the electrode. The efficiently produced MEA does not crack or deform during operation and does not decrease the ionic conductivity of the structure, thereby improving the fuel cell performance (3:45-60, 4:15-25).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the MEA making process of Starz with the heating and pressure teachings of Grot to form a better MEA that will improve the fuel cell operation through reliability.

(10) Response to Argument

Appellant argues the admission on page 8 of the arguments of 4/23/07 is not an admission that clamping a membrane is obvious. The referenced passage of 4/23/07 states, "One of ordinary skill in the art would readily recognize what type clamp would be needed for this purpose and how the membrane would be secured in the clamp without interfering with the spray." Appellant states in the cited passage that the type of clamp needed to clamp a membrane is well known in the art and that the method of using the clamp is well known in the art and for the same intended purpose as the appellant. Since the clamp is well known in the art and the method of using the clamp is well known, it would be obvious to one skilled in the art to use a known tool for its known and intended purpose (i.e., a clamp for holding a membrane used to hold a membrane). Appellant's argument that "the clamping must be done in a way that allows the catalyst ink to be properly deposited, such as by holding the membrane by its edge as shown in figure 1." is not a limitation in the claims and therefore the arguments are not commensurate in scope with the claims.

Appellant argues the limitations drawn to the heat lamp are dismissed. Contrary to this allegation, the heat lamp limitation was addressed and done so by stating that

the air oven is equivalent to a heat lamp for drying a membrane and therefore it would be obvious to one skilled in the art to use a heat lamp in place of an air oven.

Appellant apparently argues the heat lamp and air oven are not equivalent since "an air circulating oven would not be applicable for drying the membrane as multiple sprayed layers of the catalyst are being deposited on the membrane because the spraying apparatus would need to be inside of the oven. As the catalyst is being sprayed on the membrane, and is being dried at the same time, the catalyst can be dry before the next pass is sprayed on the previously deposited catalyst." (emphasis added) Appellant's argument that the catalyst is sprayed on the membrane and dried at the same time (underlined portion) is not recited in the claims and as such is not required by the prior art. Furthermore, this argument is not commensurate in scope with the claims. Appellant alleges that "Starz does not teach or suggest spraying the catalyst in multiple passes at the same time that the membrane is being dried." This limitation of spraying the membrane and at the same time drying the membrane is not recited in the claims. As such the arguments are not commensurate in scope with the claims. The limitation of claim 13 does not preclude spraying the catalyst ink on the membrane, drying the MEA under a heat lamp (or putting the MEA inside an oven) then repeating the process with several passes of spraying then drying. As discussed in the Final Rejection, it would be obvious to one skilled in the art to spray on multiple layers to create a catalyst layer with a desired thickness. As such, the limitation of claim 13 is obvious to one skilled in the art in light of the teachings of Starz.

Appellant argues on page 5 that Starz doesn't teach the limitation of claim 21, "the ionomer in the catalyst that is sprayed on the membrane is about half of the ionomer concentration of the catalyst that is provided in the final cathode or anode of the MEA." This is not the cited limitation of claim 21. As discussed above under the New Rejections heading, the limitation of claim 21 is rejected under 112 first and second paragraph for new matter and indefiniteness. As best ascertained by the claims presented, the interpretation of the claim language is that the concentration of the ionomer was about half the carbon in the final cathode or anode, as stated in the instant specification paragraph [0027]. The amount of ionomer (Nafion) is 10 wt% of 0.4g, which gives 0.04g of Nafion. The amount of carbon is 0.1g. So the concentration of ionomer as a ratio of ionomer to carbon is about half, 0.04:0.1.

Appellant argues Swathirajan does not teach using a heat lamp for the correct catalyst slurry. As stated in the rejection and pointed out by applicant, Swathirajan teaches using a heat lamp to dry a sprayed on catalyst layer that comprises a catalyst, Nafion and carbon. The composition of the catalyst layer, the method of applying the catalyst layer and the method of drying the catalyst layer are all equivalent to the composition and method claimed by applicant. The fact that a reference teaches another method of applying a catalyst layer does not detract from the teaching that is equivalent to the claimed method. Therefore, the claimed limitations are obvious over the combined teachings of Starz and Swathirajan. Furthermore, the alleged limitation on page 9 of arguments, "spraying the catalyst ink on the MEA over several passes at the same time the MEA is being dried under a heat lamp." (emphasis added) is not

recited in the claims and therefore the arguments are not commensurate in scope with the claims.

Appellant argues Starz and Grot do not provide a *prima facie* case of obviousness because Grot does not teach a heat lamp in combination with catalyst spraying process including multiple spray passes. As stated above, the rejections are based on the combined teachings of Starz and Grot. Appellant has argued the claim limitations against the references individually and one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Grot teaches, as stated by appellant on page 9 of arguments, using a heat lamp to dry a catalyst layer. Starz has already taught the multiple spray passes. Therefore, the combined teachings of Starz and Grot obviate the claimed invention, as discussed in the Final Rejection. Appellant argues on page 9, "Using heat and pressure to form a catalyst to a membrane is the type of operation that Appellant is attempting to avoid with their claimed invention because of the problems with using pressure, as discussed in Appellant's background discussion in paragraphs [0007] - [0014]." The point of this argument is unclear since if appellant is trying to avoid using pressure and heat to form a catalyst to a membrane, why are claims 12 and 29 drawn to using pressure and heat to form a catalyst to a membrane?

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

This examiner's answer contains a new ground of rejection set forth in section **(9)** above. Accordingly, appellant must within **TWO MONTHS** from the date of this answer exercise one of the following two options to avoid *sua sponte* **dismissal of the appeal** as to the claims subject to the new ground of rejection:

(1) **Reopen prosecution.** Request that prosecution be reopened before the primary examiner by filing a reply under 37 CFR 1.111 with or without amendment, affidavit or other evidence. Any amendment, affidavit or other evidence must be relevant to the new grounds of rejection. A request that complies with 37 CFR 41.39(b)(1) will be entered and considered. Any request that prosecution be reopened will be treated as a request to withdraw the appeal.

(2) **Maintain appeal.** Request that the appeal be maintained by filing a reply brief as set forth in 37 CFR 41.41. Such a reply brief must address each new ground of rejection as set forth in 37 CFR 41.37(c)(1)(vii) and should be in compliance with the other requirements of 37 CFR 41.37(c). If a reply brief filed pursuant to 37 CFR 41.39(b)(2) is accompanied by any amendment, affidavit or other evidence, it shall be treated as a request that prosecution be reopened before the primary examiner under 37 CFR 41.39(b)(1).

Extensions of time under 37 CFR 1.136(a) are not applicable to the TWO MONTH time period set forth above. See 37 CFR 1.136(b) for extensions of time to reply for patent applications and 37 CFR 1.550(c) for extensions of time to reply for ex parte reexamination proceedings.

Respectfully submitted,

Keith Walker

/Keith Walker/

A Technology Center Director or designee must personally approve the new ground(s) of rejection set forth in section (9) above by signing below:

Conferees:

Patrick Ryan

/PATRICK RYAN/

Supervisory Patent Examiner, Art Unit 1795

William Krynski

/William Krynski/

Quality Assurance Specialist, Director Designee